does not act as a poison in preserving the timber, because it could be seen that the Limnoria were embedded in wood still highly charged with creosote.

After carefully considering the subject, the author had no doubt that the process of creosoting preserved timber from the attack of marine insects only so long as the oil existed as a film or coating on the outside of the timber. Whenever the attrition caused by the motion of the sea removed this outer film or coating, and exposed the fibrous surface of the timber, the insect would then attack and perforate it, whether it were creosoted or not, its search being for a fibrous substance in which to burrow. The time that might elapse before the timber became assailable to these insects depended on the situation. Wherever there was little abrading action of the sea, the exterior film of creosote might be longer preserved; and where there was a considerable admixture of fresh water to check the growth, or at least the avidity of the insect, the effect of their ravages might be more gradual, or, in some situations, almost inappreciable. But the result of the author's observation and experience led him irresistibly to the conclusion, that on the northern shores of the country, where works are exposed to the open sea, creosoted timber was readily perforated by the Limnoria, and could not be safely employed in any important part of a marine structure at or below half-tide level, a fact of great importance to the civil engineer.

6. On some Thermic Properties of Water and Steam. By Professor W. J. Macquorn Rankine.

The author refers to the general equation of the mechanical action of heat which Professor Clausius and he arrived at independently by different methods in 1849, and points out that the form of that equation, which was laid before the Society by him in a paper read on the 4th of February 1850, comprehends, as a particular case, the law which connects the volume of a given weight of steam with its temperature, pressure, and latent heat. He describes the use of that law, with proper numerical data, to compute, in the absence of direct experiment, tables of the density and volume of saturated steam, more accurate than those founded on the assumption of the perfectly gaseous condition, as exemplified in tables which he published in 1855 and subsequently. Referring next to the direct experiments of Messrs Fairbairn and Tate on the density of steam, published in the Philosophical Transactions for 1860, he gives a tabular comparison of the volumes of one pound of steam as determined by these experiments, and as computed theoretically from M. Regnault's experiments on the latent heat of steam, with the aid of Joule's mechanical equivalent of heat; and from that comparison he draws conclusions which may be summed up as follows:—

1. At temperatures below 212°, the differences between the results of theory and experiment are inappreciable.

2. At temperatures above 212°, the differences, although too small to be of any consequence in practical calculations connected with steam-engines, are appreciable, the volume of a pound of steam by theory being slightly greater than by experiment.

3. Small as those differences are, there exist no known sources of error either in the data of the theoretical calculation or in the method of experimenting sufficient to account for them.

4. They are therefore most probably caused by some unknown difference in the molecular condition of the steam in M. Regnault's experiments on latent heat, and in Messrs Fairbairn and Tate's experiments on density.

5. That difference of condition is probably connected with the fact, that in M. Regnault's experiments the steam was in rapid motion from a boiler towards a condenser; whereas in the experiments of Messrs Fairbairn and Tate the steam was at rest.

6. Further experimental researches are desirable.

7. Formulæ connected with small continuous Displacements of the Particles of a Medium. By Professor Tait.

Although most of the results deduced in this Note have been long known, I venture to offer it to the Society on account of the extreme simplicity of the analysis employed, and the consequent insight it affords us into the connection of various formulæ. I intend on a future occasion to give large further developments especially bearing on physics. I employ the calculus of quaternions throughout, but where some unusual expressions occur, I have given them in their common Cartesian form, as well as in the quaternion one.